

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
(Attorney Docket No. 11670.00006)

Applicant: Lifson, Alexander Group Art Unit: TBA
Serial No.: TBA Examiner: TBA
Filed: On Even Date Herewith
For: PULSED FLOW FOR CAPACITY CONTROL
Original Filing Date: December 8, 1997
Original Patent No: 6,047,556
Granted: April 11, 2000

PRELIMINARY AMENDMENT FOR REISSUE APPLICATION of
U.S. PATENT No. 6,047,556

Sir:

This Preliminary Amendment is filed herewith a request for an interference, a request for reissue application for U.S. Patent No. 6,047,556, a copy of U.S. Patent No. 6,047,556, a reissue application declaration by the inventor, an offer to surrender the patent, and a statement under 37 CFR 3.73(b). Prior to examination of the reissue application for U.S. Patent No. 6,047,556, please enter the following amendments:

IN THE CLAIMS

Kindly add the following claims:

--Claim 4. (NEW) An air conditioning or refrigeration system comprising:
a compressor having a refrigeration fluid suction port and a refrigeration fluid discharge
port; and

a valve, in fluid communication with the compressor, operative to cycle with a cycling time shorter than the response time of the system to modulate compressor capacity.

Claim 5. (NEW) The air conditioning or refrigeration system of claim 4 further comprising a capacity controller operative to generate a control signal corresponding to desired capacity modulation and operatively connected to the valve to send capacity control signals to cycle the valve with a cycling time shorter than the response time of the system to modulate compressor capacity.

Claim 6. (NEW) The air conditioning or refrigeration system of claim 4 wherein the valve is cycled between a fully open and a fully closed position.

Claim 7. (NEW) The air conditioning or refrigeration system of claim 5 wherein the controller comprises a microprocessor.

Claim 8. (NEW) The air conditioning or refrigeration system of claim 4 wherein the valve is a solenoid valve.

Claim 9. (NEW) An air conditioning or refrigeration system comprising:
a compressor having a refrigeration fluid suction port and a refrigeration fluid discharge port, being operative to compress refrigeration fluid received via the suction port and discharged via the discharge port;
a refrigerant flow line operative to carry refrigeration fluid and in fluid communication with the compressor;
a capacity controller operative to generate a control signal corresponding to desired capacity modulation; and
a valve in the refrigerant flow line which is operatively connected to the controller to receive capacity control signals from the controller and operative in response to capacity control signals received from the controller to cycle with a cycling time shorter than the response time of the system to modulate compressor capacity.

Claim 10. (NEW) The system of claim 9 wherein the valve is cycled between a fully open position and a fully closed position.

Claim 11. (NEW) The system of claim 9 wherein the system capacity controller comprises a microprocessor.

Claim 12. (NEW) The system of claim 9 wherein the valve is a solenoid valve.

Claim 13. (NEW) The system of claim 10 wherein the valve in the fully closed position permits a limited fluid flow through the refrigerant flow line.

Claim 14. (NEW) An air conditioning or refrigeration system comprising:

a compressor having a refrigeration fluid suction port and a refrigeration fluid discharge port, being operative to compress refrigeration fluid received via the suction port and discharged via the discharge port;

a refrigerant flow line operative to carry refrigeration fluid and in fluid communication with the compressor;

a capacity controller operative to generate a control signal corresponding to desired capacity modulation; and

a solenoid valve in the refrigerant flow line which is operatively connected to the controller to receive capacity control signals from the controller and operative in response to capacity control signals received from the controller to cycle between a fully open position and a fully closed position to modulate compressor capacity.

Claim 15. (NEW) The system of claim 14 wherein the system capacity controller comprises a microprocessor.

Claim 16. (NEW) The system of claim 14 wherein the solenoid valve in the fully closed position permits a limited fluid flow through the refrigerant flow line.

- Claim 17. (NEW) A capacity modulated compressor for an air conditioning or refrigeration system having a refrigerant flow line, comprising:
- a compressor housing comprising a compression chamber, at least one refrigerant injection port operative to pass refrigerant to the compression chamber, and at least one refrigerant discharge port operative to pass compressed refrigerant from the compression chamber;
- a capacity controller operative to generate a control signal corresponding to desired capacity modulation; and
- a valve operatively connected to the controller to receive capacity control signals from the controller and operative in response to capacity control signals received from the controller to cycle with a cycling time shorter than the response time of the system to modulate compressor capacity.
- Claim 18. (NEW) The compressor of claim 17 wherein the valve is cycled between a fully closed position and a fully open position.
- Claim 19. (NEW) The compressor of claim 17 wherein the valve is disposed in a refrigerant flow line upstream with respect to refrigerant flow to said at least one refrigerant injection port.
- Claim 20. (NEW) The compressor of claim 17 wherein the valve is mounted to the compressor housing at the refrigerant injection port.
- Claim 21. (NEW) The compressor of claim 17 wherein the system capacity controller comprises a microprocessor.
- Claim 22. (NEW) The compressor of claim 17 wherein the valve is a solenoid valve.
- Claim 23. (NEW) The compressor of claim 18 wherein the valve in the fully closed position permits a limited fluid flow through the refrigerant flow line.

Claim 24. (NEW) A capacity modulated compressor for an air conditioning or refrigeration system having a refrigerant flow line, comprising:

a compressor housing comprising a compression chamber, at least one refrigerant injection port operative to pass refrigerant to the compression chamber, and at least one refrigerant discharge port operative to pass compressed refrigerant from the compression chamber;

a capacity controller operative to generate a control signal corresponding to desired capacity modulation; and

a solenoid valve operatively connected to the controller to receive capacity control signals from the controller and operative in response to capacity control signals received from the controller to cycle between a fully open position and a fully closed position to modulate compressor capacity.

Claim 25. (NEW) The compressor of claim 24 wherein the solenoid valve is disposed in a refrigerant flow line upstream with respect to refrigerant flow to said at least one refrigerant injection port.

Claim 26. (NEW) The compressor of claim 24 wherein the solenoid valve is mounted to the compressor housing at the refrigerant injection port.

Claim 27. (NEW) The compressor of claim 24 wherein the system capacity controller comprises a microprocessor.

Claim 28. (NEW) The compressor of claim 24 wherein the solenoid valve in the fully closed position permits a limited fluid flow through the refrigerant flow line.

Claim 29. (NEW) A capacity modulated compressor comprising:

a compressor having a suction inlet for supplying suction gas to the compressor;

a valve provided in the suction gas flow path to the compressor, the valve being operable between open and closed positions to cyclically allow and prevent flow of suction gas into the compressor;

a controller for actuating the valve between the open and closed positions, the controller being operative to cycle the valve such that its cycle time is shorter than the response time of the system to modulate compressor capacity.

Claim 30. (NEW) The capacity modulated compressor of claim 29 wherein the valve is positioned in close proximity to the compressor.

Claim 31. (NEW) The capacity modulated compressor of claim 29 wherein the valve is a bi-directional valve.

Claim 32. (NEW) The capacity modulated compressor of claim 29 wherein the valve is a solenoid valve.

Claim 33. (NEW) A method of modulating the capacity of a compressor in an air conditioning or refrigeration system, comprising cycling a valve, in fluid communication with the compressor, using a cycle time shorter than the response time of the system to modulate compressor capacity.

Claim 34. (NEW) The method of claim 33 wherein the valve is a solenoid valve.

Claim 35. (NEW) A method of modulating the capacity of a compressor in a closed refrigerant circulating system, said compressor comprising a compression chamber having a port connected to a refrigerant line of the system through which refrigerant is supplied to the compression chamber, comprising:

rapidly cycling a solenoid valve disposed in the refrigerant line upstream of said port between its fully open position and its fully closed position to modulate compressor capacity.

Claim 36. (NEW) The method of claim 35 wherein rapidly cycling said solenoid valve comprises cycling the solenoid valve with a cycling time shorter than the response time of the system to modulate compressor capacity.

Claim 37. (NEW) The method of claim 35 wherein said cycling controls the percentage of time said solenoid valve is fully open to refrigerant flow therethrough to the compression chamber.

Claim 38. (NEW) The method of claim 35 wherein said cycling is controlled by a microprocessor.--

REMARKS

I. Status of Claims

Original claims 1-3 and new claims 4-38 are presented in this reissue application. Applicant respectfully requests examination of claims 1-38.

II. Brief Introduction to U.S. Patent No. 6,047,556

As discussed in the Reissue Application Declaration, at the time of filing patent application 08/986,447, which issued as U.S. Patent No. 6,047,556 on April 11, 2000 (hereafter the '556 patent), applicant failed to claim inventive methods and apparatus disclosed in the specification of the '556 patent. Applicant has filed this reissue application to remedy this error, and applicant has now directed claims in this Preliminary Amendment to the inventive methods and apparatus disclosed in the original specification filed on December 8, 1997 but not originally claimed.

Presented claims 4-8 are directed to air conditioning or refrigeration systems comprising a compressor and a valve, in fluid communication with the compressor, operative to cycle with a cycling time shorter than the response time of the system to modulate compressor capacity. The cycling of the valve using a cycle time that is shorter than the response time of the system to modulate compressor capacity provides a unique and novel air conditioning or refrigeration system.

Presented claims 9-13 are directed to air conditioning or refrigeration systems comprising a compressor, a refrigerant flow line in fluid communication with the compressor, a capacity controller and

a valve in the refrigerant flow line which is operatively connected to the controller to receive capacity control signals from the controller, and operative in response to capacity control signals received from the controller to cycle with a cycling time shorter than the response time of the system to modulate compressor capacity. It is a significant and novel advantage that the cycling time of the valve is shorter than the response time of the system. Prior known air conditioning and refrigeration systems do not have this unique and useful feature, and, therefore, embodiments of the systems now claimed in new claims 9-13 can provide improvements over prior known air conditioning and refrigeration systems.

Presented claims 14-16 are directed to an air conditioning or refrigeration system comprising a compressor, a refrigerant flow line, a capacity controller and a solenoid valve in the refrigerant flow line which is operatively connected to the controller to receive capacity control signals from the controller, and operative in response to capacity control signals received from the controller to cycle between a fully open position and a fully closed position to modulate compressor capacity. Systems embodying a solenoid valve, which cycles between a fully open position and a fully closed position to modulate compressor capacity, can provide improved operation.

Presented claims 17-23 are directed to a capacity modulated compressor for an air conditioning or refrigeration system comprising a compressor housing, at least one refrigerant injection port and at least one refrigerant discharge port, a capacity controller, and a valve operatively connected to the controller to receive capacity control signals from the controller. There exists a need in the art for a capacity modulated compressor comprising a valve that is operative, in response to capacity control signals received from the controller, to cycle with a cycling time shorter than the response time of the system to modulate compressor capacity. Such compressors may be implemented to improve existing air conditioning or refrigeration systems.

Presented claims 24-28 are directed to a capacity modulated compressor for an air conditioning or refrigeration system comprising a compressor housing, at least one refrigerant injection port and at least one refrigerant discharge port, a capacity controller, and a solenoid valve operatively connected to the controller to receive capacity control signals from the controller. There exists a need in the art for a capacity modulated compressor comprising a solenoid valve that is operative, in response to capacity control signals received from the controller, to cycle between a fully open and a fully closed position to modulate compressor capacity. Embodiments of claims 24-28 may be used in aftermarket modification of prior systems.

Presented claims 29-34 are directed to a capacity modulated compressor comprising a compressor having a suction inlet; a valve in the suction gas flow path, the valve being operable between open and closed positions to cyclically allow and prevent flow of suction gas into the compressor, and a controller for actuating the valve between the open and closed positions such that the cycle time of the valve is shorter than the response time of the system to modulate compressor capacity. Compressors including novel features, such as a controller that cycles a valve with a cycling time shorter than the response time of the system to modulate compressor capacity, can provide improved operation over existing compressors.

Presented claims 33-34 are directed to a method of modulating the capacity of a compressor comprising cycling a valve, in fluid communication with the compressor, using a cycling time shorter than the response time of the system to modulate compressor capacity. Systems implementing this unique and novel method provide numerous advantages over methods used to modulate compressor capacity in prior systems.

Presented claims 35-38 are directed to a method of modulating the capacity of a compressor by rapidly cycling a solenoid valve, disposed in the refrigerant line, between its fully open position and its fully closed position to modulate compressor capacity. Systems implementing this unique method can provide improved performance over prior systems because of the cycling of the solenoid valve between its fully open and fully closed position.

III. Support for New Claims 4-38

Support for new claims 4-38 may be found throughout the specification and the figure as originally filed. Support for new claims 4-32 is shown in Table I attached as Exhibit A. Support for new claims 33-38 is shown in Table II attached as Exhibit B. The support shown in Tables I and II is, in general, merely exemplary and/or illustrative of the full support provided by the specification, figure, abstract and claims.

IV. Conclusion

Applicant respectfully submits that new claims 4-38 are directed to patentable methods and apparatus that were originally disclosed but not previously claimed. Applicant respectfully requests entry of these amendments and examination and allowance of claims 1-38.

Respectfully submitted,
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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231 on: July 30, 2001.


Rachelle Chery

07/30/01
Date